

## AEROLOGICAL OBSERVATIONS

(Aerological Division, D. M. LITTLE, in charge)

By L. T. SAMUELS

The departures shown in table 1 are based on "normals" that in most cases represent comparatively few observations. (See footnotes at bottom of table.) Free-air temperature departures were negative, except at Omaha, with the largest departures occurring at Boston. Relative humidity departures were negative, except over California, where they were positive. The monthly free-air temperatures averaged lowest over the northeastern part of the country, and highest over central Texas. Free-air relative humidities averaged highest over the Northwest, and lowest over the Gulf coast.

Table 2 has been revised so as to include, so far as possible, all of the airplane weather observation stations shown in table 1. The free-air resultant wind directions deviated mostly from normal over the Pacific coast, where a preponderance of southerly components occurred, and over the Ohio River Valley, where northerly components predominated. Elsewhere resultant directions were generally close to normal. Resultant free-air wind velocities were generally above normal over the middle Mississippi and Ohio River Valleys and over the western part of the country. Elsewhere these departures were mostly negative.

TABLE 1.—Free-air temperatures and relative humidities obtained by airplanes during January 1935

TEMPERATURE (°C.)																			
Stations	Altitude (meters) m. s. l.																	Number of observations	
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean		Departure from normal
Billings, Mont. <sup>1</sup> (1,088 m).....	-6.9						-2.4		-1.0		-3.0		-5.7		-12.5		-19.7	31	
Boston, Mass. <sup>2</sup> (6 m).....	-6.8	-4.8	-7.2	-3.4	-9.0	-3.8	-9.5	-3.6	-11.0	-3.6	-12.8	-3.5	-13.9	-2.5	-18.6	-1.8	-23.7	11	
Cheyenne, Wyo. <sup>1</sup> (1873 m).....	-2.9								-0.9		0.9		-1.6		-7.9		-14.8	31	
Fargo, N. Dak. (274 m).....	-18.5		-17.4		-11.9		-8.6		-8.2		-9.4		-11.1		-16.4		-23.3	30	
Kelly Field (San Antonio), Tex. <sup>3</sup> (206 m).....	9.2		11.7		11.4		11.1		9.8		7.8		4.9		-0.4		-6.7	29	
Lakehurst, N. J. <sup>4</sup> (39 m).....	0.7		1.1		-1.2		-2.6		-4.1		-4.7		-6.9		-13.0		-21.6	10	
Maxwell Field (Montgomery), Ala. <sup>3</sup> (52 m).....	6.9		8.3		8.9		8.6		6.3		3.7		1.7		-3.1		-8.7	29	
Mitchel Field (Hempstead, L. I.), N. Y. <sup>3</sup> (29 m).....	-4.6		-4.7		-6.5		-6.9		-7.5		-8.3		-10.0		-15.4		-21.9	15	
Murfreesboro, Tenn. <sup>1</sup> (174 m).....	2.1		2.4		2.5		2.9		2.1		0.4		-1.7		-7.0		-13.3	30	
Norfolk, Va. <sup>4</sup> (10 m).....	3.6	-2.2	2.8	-2.4	1.9	-2.0	1.3	-1.2	0.2	-0.8	-1.2	-0.5	-2.8	-0.3	-7.7	-0.3	-14.2	24	
Oklahoma City, Okla. <sup>1</sup> (391 m).....	3.0		4.1		7.7		7.2		5.0		2.7		-0.7		-6.9		-14.3	29	
Omaha, Nebr. <sup>1</sup> (300 m).....	-7.5	-2.3	-6.7	-2.6	-3.2	-1.8	+0.1	+0.4	-0.1	+1.1	-1.7	+1.8	-4.5	+1.7	-10.2	+2.0	-16.6	29	
Pearl Harbor, Hawaii (6 m).....	19.7	-3.3	19.3	-0.4	15.4	-0.3	12.1	-1.0	10.2	-0.8	8.7	-0.4	6.5	-0.3	1.4	-0.3	-4.7	30	
Pensacola, Fla. <sup>4</sup> (24 m).....	6.3	-4.2	8.5	-2.0	8.1	-1.2	7.4	-0.6	5.1	-1.3	3.5	-0.9	1.4	-0.8	-3.9	-0.7	-9.1	20	
San Diego, Calif. <sup>4</sup> (10 m).....	9.6	-2.2	12.3	+0.3	10.6	+0.1	8.3	0.0	5.7	-0.2	3.4	-0.1	1.1	0.0	-4.6	+0.7	-11.4	29	
Scott Field (Belleville), Ill. <sup>3</sup> (135 m).....	-4.1		-3.7		-0.8		0.0		-0.6		-1.7		-4.1		-8.7		-15.2	22	
Seattle, Wash. <sup>4</sup> (25 m).....	4.8		6.1		5.3		2.8		-0.3		-3.2		-6.0		-12.3		-19.3	12	
Selfridge Field (Mount Clemens), Mich. <sup>3</sup> (177 m).....	-7.2		-8.1		-8.9		-8.7		-9.3		-10.8		-13.0		-18.3		-23.8	25	
Spokane, Wash. <sup>3</sup> (596 m).....	2.5				5.9		6.5		5.1		2.5		-0.3		-6.1		-12.5	10	
Sunnyvale, Calif. <sup>4</sup> (10 m).....	6.8	-1.9	8.2	-0.3	8.3	-0.4	6.0	-1.2	3.2	-1.8	0.5	-1.9	-2.2	-1.9	-7.5	-1.0	-13.5	24	
Washington, D. C. <sup>4</sup> (13 m).....	-3.1	-3.3	-3.4	-3.8	-4.5	-3.9	-4.8	-3.1	-5.1	-2.2	-6.0	-1.8	-7.6	-1.5	-11.3	-1.4	-17.0	18	
Wright Field (Dayton), Ohio <sup>3</sup> (244 m).....	-3.5		-3.9		-4.0		-3.2		-3.7		-5.4		-7.2		-11.4		-17.0	24	
RELATIVE HUMIDITY (PERCENT)																			
Billings, Mont. <sup>1</sup> (1088 m).....	64						55		48		49		53		59		60		
Boston, Mass. <sup>2</sup> (6 m).....	68	-3	65	-5	64	-6	62	-5	60	-5	58	-4	58	-2	52	-7	50	-7	
Cheyenne, Wyo. <sup>1</sup> (1873 m).....	53								51		44		42		40		39		
Fargo, N. Dak. <sup>1</sup> (274 m).....	87		80		72		68		62		60		58		54		52		
Kelly Field (San Antonio), Tex. <sup>3</sup> (206 m).....	85		71		67		56		47		40		39		34		28		
Lakehurst, N. J. <sup>4</sup> (39 m).....	73		74		74		67		60		54		54		47		41		
Maxwell Field (Montgomery), Ala. <sup>3</sup> (52 m).....	81		68		61		49		49		48		44		34		35		
Mitchel Field (Hempstead, L. I.), N. Y. <sup>3</sup> (29 m).....	68		65		63		61		59		60		58		58		55		
Murfreesboro, Tenn. <sup>1</sup> (174 m).....	78		74		68		59		56		54		54		47		47		
Norfolk, Va. <sup>4</sup> (10 m).....	69	-4	65	-3	60	-3	55	-3	49	-3	45	-3	41	-3	40	-3	44	-3	
Oklahoma City, Okla. <sup>1</sup> (391 m).....	75		72		59		48		42		38		36		34		34		
Omaha, Nebr. <sup>1</sup> (300 m).....	81	-1	76	-2	63	-3	54	-3	47	-3	44	-5	45	-4	46	0	42	-1	
Pearl Harbor, Hawaii <sup>5</sup> (6 m).....	81	+10	76	+2	78	+1	75	+5	67	+6	56	+6	48	+8	40	+8	34	+8	
Pensacola, Fla. <sup>4</sup> (24 m).....	73	-8	62	-12	58	-10	52	-10	46	-10	43	-9	39	-9	32	-9	24	-10	
San Diego, Calif. <sup>4</sup> (10 m).....	82	+13	64	+4	58	+6	52	+5	46	+5	38	+2	35	+3	32	+3	30	+3	
Scott Field (Belleville), Ill. <sup>3</sup> (135 m).....	80		69		54		47		45		41		41		36		36		
Seattle, Wash. <sup>4</sup> (25 m).....	83		71		64		61		61		59		56		50		53		
Selfridge Field (Mount Clemens), Mich. <sup>3</sup> (177 m).....	81		76		66		54		48		46		46		48		48		
Spokane, Wash. <sup>3</sup> (596 m).....	86				68		63		59		64		65		64		64		
Sunnyvale, Calif. <sup>4</sup> (10 m).....	89	+7	73	+1	62	+2	58	+4	54	+6	47	+5	42	+4	39	+2	39	+2	
Washington, D. C. <sup>4</sup> (13 m).....	64	-6	60	-2	56	-2	52	-3	47	-4	43	-4	41	-2	41	-3	44	-3	
Wright Field (Dayton), Ohio <sup>3</sup> (244 m).....	80		78		71		60		52		52		49		43		40		

Observations taken about 5:00 a. m., 75th meridian time, except along the Pacific coast and Hawaii where they are taken at dawn.

<sup>1</sup> Weather Bureau.<sup>2</sup> Massachusetts Institute of Technology.<sup>3</sup> Army.<sup>4</sup> Navy.<sup>5</sup> National Guard.

NOTE.—Boston normals based on 57 observations; Norfolk normals based on 79 observations; Omaha normals based on 119 observations; Pearl Harbor normals based on 91 observations; Pensacola normals based on 128 observations; San Diego normals based on 151 observations; Sunnyvale normals based on 51 observations; Washington normals based on 130 observations.

TABLE 2.—Free-air resultant winds (meters per second) based on pilot balloon observations made near 6 a. m. (E. S. T.) during January 1935

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,088 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio, (153 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (274 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Murfrees- boro, Tenn. (189 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface....	354	1.1	337	2.3	240	2.6	305	3.1	282	6.0	294	2.5	310	1.0	242	1.8	313	1.2	41	0.4	26	2.5	142	0.9	193	0.3
500.....	352	3.1	352	3.1	300	7.3	300	7.3	280	4.2	247	3.4	254	5.3	315	3.4	254	1.2	40	3.3	147	1.3	210	2.1	210	2.1
1,000.....	309	3.6	309	3.6	278	6.3	302	7.6	278	6.3	264	6.7	268	8.4	281	6.5	301	3.9	52	1.6	166	4.6	241	3.8	241	3.8
1,500.....	301	6.5	301	6.5	241	8.2	298	10.1	278	9.6	295	8.3	283	7.5	273	9.7	319	3.8	50	0.9	216	6.1	287	7.0	287	7.0
2,000.....	302	2.4	303	7.9	266	8.9	311	12.6	279	7.4	284	11.5	309	8.6	286	12.7	304	5.7	6	1.1	235	9.8	316	8.8	316	8.8
2,500.....	268	4.2	306	8.1	275	12.1	288	12.5	275	12.0	288	13.2	322	11.4	314	12.9	289	17.0	297	5.7	305	2.8	234	10.0	306	11.1
3,000.....	274	7.1	304	9.6	283	12.4	280	10.7	280	10.7	301	15.3	313	14.2	313	14.2	289	17.0	282	6.1	300	4.4	260	9.9	300	11.0
4,000.....	271	9.9	271	9.9	276	12.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3	280	11.3
5,000.....	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5

Altitude (m) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Har- bor, Terri- tory of Ha- waii <sup>1</sup> (68 m)		Pensacola, Fla. <sup>1</sup> (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washing- ton, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
Surface....	312	2.5	114	1.4	198	0.8	24	0.9	40	0.2	32	2.3	270	1.4	171	2.0	73	1.1	85	1.2	164	1.9	189	2.4	335	1.9
500.....	315	7.3	6	0.4	194	3.2	264	1.9	224	0.8	35	1.3	271	4.3	194	0.7	194	0.7	299	0.9	190	5.9	318	5.3	318	5.3
1,000.....	313	10.3	241	2.7	244	4.2	274	4.4	224	1.5	282	2.3	300	7.8	229	1.0	229	1.0	288	8.3	188	7.6	206	6.1	307	7.8
1,500.....	317	8.9	240	3.9	255	4.9	270	8.4	223	1.8	286	3.8	297	9.3	168	3.2	199	1.7	311	11.2	197	7.8	221	9.0	293	10.4
2,000.....	317	13.0	235	4.9	272	6.8	298	11.8	222	1.8	253	3.3	298	12.1	184	6.6	205	1.9	200	8.6	237	7.9	291	13.1	291	13.1
2,500.....	249	5.3	283	7.4	295	15.5	241	1.8	302	13.0	310	12.4	310	12.4	213	5.4	239	2.3	210	9.0	247	9.9	298	15.3	298	15.3
3,000.....	260	6.6	286	6.9	299	16.0	281	1.3	310	14.2	310	14.2	310	14.2	246	6.1	258	2.4	219	9.5	246	10.2	246	10.2	246	10.2
4,000.....	234	8.2	283	10.0	300	6.7	283	10.0	283	10.0	283	10.0	283	10.0	251	7.9	253	3.7	253	3.7	253	3.7	253	3.7	253	3.7
5,000.....	234	8.2	283	10.0	300	6.7	283	10.0	283	10.0	283	10.0	283	10.0	251	7.9	253	3.7	253	3.7	253	3.7	253	3.7	253	3.7

<sup>1</sup> Navy stations.

## RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES, in charge]

By RICHMOND T. ZOCH

Although there were numerous floods in the eastern half of the United States in January, as shown in the accompanying flood table, none of those for which complete reports are available caused more than slight damage. Timely warnings were issued for each of these floods.

Complete reports are not available for the floods in the Connecticut River in New England and the Tallahatchie River in Mississippi. The significant features of these floods will be described in a later issue of the MONTHLY WEATHER REVIEW.

Local floods in small streams where the flood warning service is not maintained were reported in the Bull Hook Creek, near Havre, Mont.; in portions of the State of Washington; and near Memphis, Tenn. The official in charge of the Memphis, Tenn., Weather Bureau office comments as follows on the last-mentioned flood:

There are no gages and the Weather Bureau does not furnish a flood-warning service on the following streams of Shelby County, Tenn.: Wolf River, which flows into the Mississippi at Memphis; Loosahatchie River which flows into the Mississippi a few miles north of Memphis; and Nonconah Creek, which flows into the Mississippi on the southern outskirts of Memphis. All of the above streams overflowed their banks on January 20, 1935, and during the night of the 21st reached unprecedented high stages, at least unprecedented for the last 2 decades. The precipitation

at Memphis during the preceding days was 0.59 on January 18, 3.74 on January 19, and 3.74 on January 20, making a total of 8.07 inches in 3 days.

The heavy rainfall was general throughout the Memphis area. A trace of sleet, and 3.2 inches of snow, fell on the 21st. A cold wave occurred on the 21-22, reaching a minimum temperature of 12° on the 22d. The weather continued cold for the next several days, adding to the suffering of livestock, and increasing traffic hazards. All highway traffic into Memphis was halted on the 21st due to washed out roads and bridges, and water on the highways to a considerable depth in places, with the exception of one highway from the east and highways to the west. Several railroads leading into Memphis had to run their trains over other lines for several days until repairs could be made. The Shelby County engineer conservatively estimates the damage to roads and bridges in Shelby County at \$100,000. Owing to the comparatively low stage of the Mississippi River at Memphis on January 21 and the high water in Wolf River, there was a "run-out" on Wolf River on that date. Shortly after noon of the 21st several steamboats, not steamed up, broke from their moorings on Wolf River at the Anderson-Tully Lumber Co. and were carried rapidly downstream by the swift current, crashing and tearing loose other water craft and floating equipment. By the time the runaways reached the Mississippi River there were nearly 50 pieces of river craft in the wreck, including launches, motorboats, steamboats, dredges, dry-docks, pontoons, and other floating equipment. The United States steamboat inspectors estimate this damage at approximately \$100,000. An unestimated number of hogs and cows were drowned, and probably a small number of other livestock.

The total damage of this flood is conservatively estimated at over \$200,000.